

REMARKS

In the Office Action, claims 1-6 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite because no column was defined. The claims have been amended to overcome this rejection.

Claims 1 and 3 were rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,707,293 to Wan et al. Claim 1 has been amended to more clearly define the subject matter of the invention. Accordingly, claim 1 is no longer anticipated by Wan et al. and is patentable over the cited prior art. Claim 3 depends from claim 1 and is therefore allowable for at least the same reasons.

Claims 2, 4, and 6 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,930,905 to Zabler et al. in view of U.S. Patent No. 6,707,293 to Wan et al. and U.S. Patent No. 6,404,084 to Niki et al. Applicant respectfully traverses this rejection.

According to the Examiner, Niki et al. teaches that the “utilization of different gears . . . for transmission of rotational movement is commonly know in the art.” While it is true that Niki et al. discloses three gears 15, 17, 18 of different sizes that are linked with a driven shaft to detect an aspect of its rotation, this is where the applicable teaching of Niki et al. ends. The gears 15, 17, and 18 of Niki et al. comprise speed increasing gears 6 that turn a single rotor 22 of which the rotational speed is measure. The purpose of the speed increasing gears 6 is to create a “speed increasing ratio of the rotational frequency of the output shaft 5 to that of the rotor-gear 19” of 1:72.9. See column 4, lines 1-9. There is no measurement of the degree of rotation of the gears 15, 17, 18 in the device of Niki et al. Instead, the two rotation sensors H1 and H2 speed

speed of rotation of only the rotor. See column 4, lines 36-42. The speed of rotation of the rotor, as indicative of the speed of rotation of the drive shaft 5, is used to determine loss in rotational speed that is indicative of an obstruction caught in the window or sunroof that prevents closing. This disclosure of sensing rotational speed of a drive shaft for power windows or sun roofs is in no way analogous to the issue of measuring the degree of rotation of a steering wheel.

To establish a prima facie case of obviousness, the prior art references must teach or suggest all of the claim limitations. In addition, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally recognized in the art, to modify or combine the references, and there must be a reasonable expectation of success. See MPEP § 2142.

The cited references fail to teach at least a second gear rotating in synchronization with the first gear at a speed faster than a speed of the first gear and a third gear rotating in synchronization with the first gear at a speed slower than a speed of the second gear, with a computation unit configured to compute a rotation angle of the steering shaft by detecting rotation angles of the second and third gears.

The invention relates to a 360-degree rotary position sensor. The magnet 106 is fixed on an end of the shaft 108. Opposing to the magnet 106, the sensor 100 includes the Hall sensor 102 and the magnetoresistive sensor 104. Due to the size of the magnet 106 and the positional relationship between the magnet 106 and the sensor 100 shown in Fig. 1, the sensing direction is substantially perpendicular to the axial direction of the shaft 108. Thus, since the Hall sensor 102 senses a component of a magnetic field in a direction parallel to the package of the sensor, the output of the sensor 100 is

easy to be affected by an external magnetic field. Although the Examiner stated that the sensing direction of Wan et al. substantially coincides with the axial direction of the steering shaft while indicating the description of Col. 2, lines 52-64, there is no such a definition about the sensing direction in the same description.

Zabler et al. discloses a method and device for detecting an angle of a rotating body. The device includes a first gear 11, a second gear 12, a third gear 13, and AMR sensors 22, 23. Because the sensing direction of the device is perpendicular to the axial direction of the shafts of the gears 12, 13, the outputs of the sensors 22, 23 is easily affected by an external magnetic field. Zabler's device essentially corresponds to the prior art shown in Fig. 9(a) of this application.

Referring to page 8, line 12 through the last line of page 8, to determine the absolute steering angle of the steering wheel, it is important that the gears 2, 3 are provided with different sizes and different numbers of teeth. Take, for instance, a steering angle of α degrees. If the gears 2, 3 have the same size and the same number of teeth, the device cannot determine whether the absolute steering angle of the steering wheel is α degrees or $\alpha \pm 360^\circ$ or $\alpha \pm 720^\circ$ because the rotation angles of the gears 2, 3 become equal to each other. If the gears 2, 3 have different sizes and different numbers of teeth, they provide different combinations of the rotation angles when the absolute steering angle is α degrees, $\alpha \pm 360^\circ$, and $\alpha \pm 720^\circ$.

Further, the Examiner has not set forth any suggestion or motivation to combine the references. In fact, no such motivation exists. Most notably, neither the disclosure in the cited references, nor the knowledge generally recognized in the art, would

suggest combining the drive gears of Niki et al. with the magnet-supporting gears of Zabler et al.

Claim 5 was rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 6,707,293 to Wan et al. in view U.S. Patent No. 6,404,084 to Niki et al. Claim 5 depends from claim 1 and is therefore allowable for at least the same reasons. Thus Applicant asserts that this rejection should be withdrawn.

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims.


Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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